



3. The process of claim 2 further comprising separating unreacted nickel chloride from the hydrocyanation catalyst.

4. The process of claim 2 where the reducing metal is Zn or Fe.

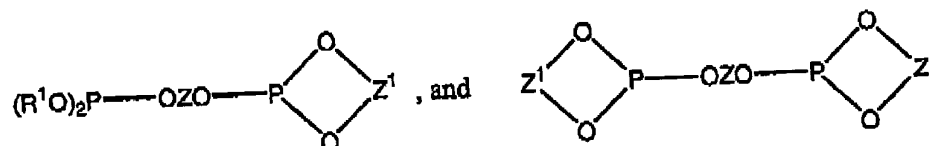
5. The process of claim 4 wherein the catalyst preparation is conducted at a temperature of 30 to 100 °C and at a pressure of 5 to 50 psia (34 to 340 kPa).

6. The process of claim 5 wherein the catalyst preparation is conducted at a temperature of 50 to 90 °C.

7. The process of claim 6 wherein the molar ratio of nickel chloride to reducing metal is 2:1 to 50:1.

8. The process of claim 7 wherein the molar ratio of nickel chloride to reducing metal is 2:1 to 25:1.

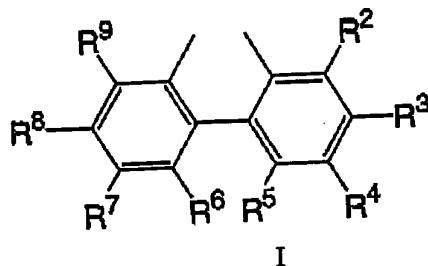
9. The process of claim 8 wherein the bidentate phosphorous-containing ligand is a compound selected from the group consisting of:



wherein:

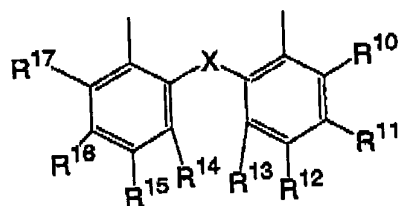
R^1 is phenyl or naphthyl, wherein the phenyl or naphthyl is unsubstituted or substituted with one or more C_1 to C_{12} alkyl or C_1 to C_{12} alkoxy groups; and

Z and Z^1 are independently selected from the group consisting of radicals having the formulae I, II, III and IV:



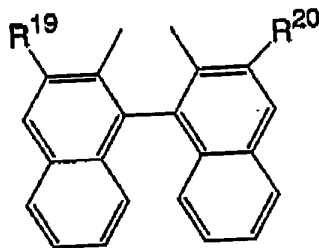
wherein:

R^2 and R^9 are the same and are H, C_1 to C_{12} alkyl, or C_1 to C_{12} alkoxy;
 R^3 and R^8 are the same and are H, C_1 to C_{12} alkyl, or C_1 to C_{12} alkoxy;
 R^4 and R^7 are the same and are H, C_1 to C_{12} alkyl, or C_1 to C_{12} alkoxy;
 R^5 and R^6 are the same and are H, C_1 to C_{12} alkyl, or C_1 to C_{12} alkoxy;



wherein:

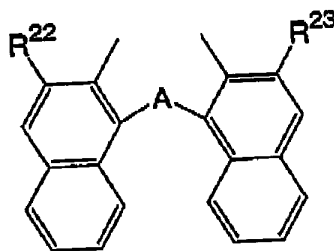
X is O, S, or $CH(R^{18})$;
 R^{10} and R^{17} are the same and are H, C_1 to C_{12} alkyl, or C_1 to C_{12} alkoxy;
 R^{11} and R^{16} are the same and are H, C_1 to C_{12} alkyl, or C_1 to C_{12} alkoxy;
 R^{12} and R^{15} are the same and are H, C_1 to C_{12} alkyl, or C_1 to C_{12} alkoxy;
 R^{13} and R^{14} are the same and are H, C_1 to C_{12} alkyl, or C_1 to C_{12} alkoxy; and
 R^{18} is H or C_1 to C_{12} alkyl;



III

wherein:

R¹⁹ and R²⁰ are the same and are H or CO₂R²¹; and
R²¹ is C₁ to C₁₂ alkyl or C₆ to C₁₀ aryl, unsubstituted or substituted with C₁ to C₄ alkyl groups;



IV

wherein:

A is O, S, CH(R²⁴);
R²² and R²³ are the same and are H or CO₂R²⁵;
R²⁴ is H or C₁ to C₁₂ alkyl; and
R²⁵ is C₁ to C₁₂ alkyl.

10. The process of claim 9 wherein unreacted nickel chloride is separated from the hydrocyanation catalyst and is recycled for use in the hydrocyanation catalyst production process.

11. The process of claim 9 wherein the nickel chloride initially contacted with the nitrile solvent and bidentate phosphorous-containing ligand comprises anhydrous nickel chloride.

12. The process of claim 11 wherein the anhydrous nickel chloride is produced by a process comprising treating hydrated nickel chloride at a temperature of about 200 to about 240°C for a time less than 12 hours.

13. (currently amended) The process of claim 12 wherein the hydrated nickel chloride is $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$ or $\text{NiCl}_2 \cdot 2\text{H}_2\text{O}$ $\text{NiCl}_2 \cdot 2\text{H}_2\text{O}$.

14. The process of claim 11 wherein the anhydrous nickel chloride is produced by a process comprising:

(a) spray drying an aqueous solution of nickel chloride at an exit temperature of about 120 to about 150°C; and

(b) thermally drying the product of step (a) at a temperature between about 200 to about 240°C for a time of less than 12 hours.

15. The process of claim 14 wherein the spray drying exit temperature is about 130 to about 135°C with a mean residual time of heat exposure between 1 and 45 seconds.

16. The process of claim 15 wherein the reducing metal has a particle size of 20 mesh or less.

17. The process of claim 1 wherein the nitrile solvent is an unsaturated nitrile.

18. The process of claim 17 wherein the nitrile solvent is selected from the group consisting of 3-pentenitrile and 2-methyl-butenitrile.